

## DRAWINGS

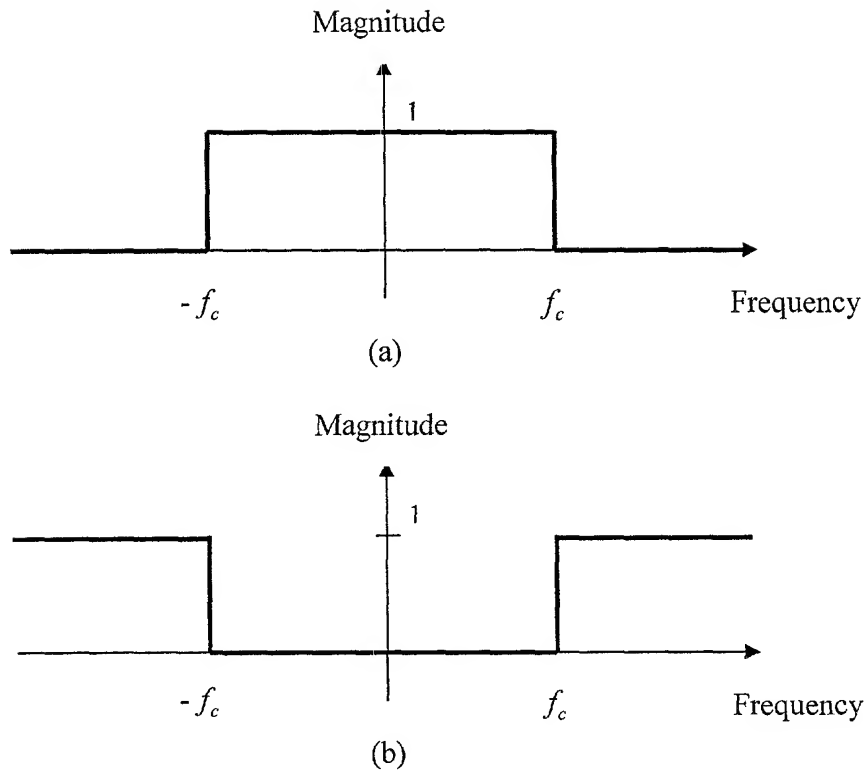


Figure 1: (a) An ideal low-pass filter to stop the broad-band signal. (b) An ideal high-pass filter to stop the voice-band signal.

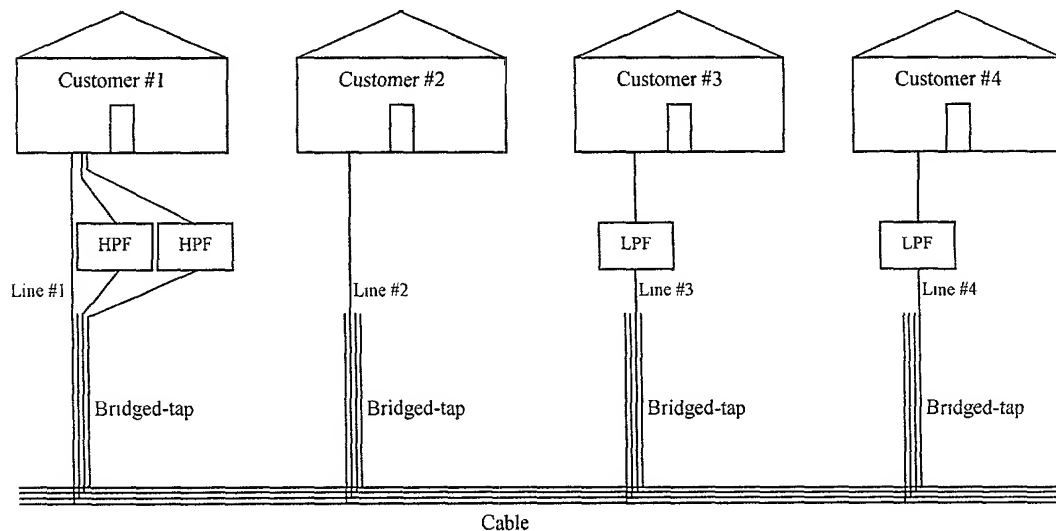
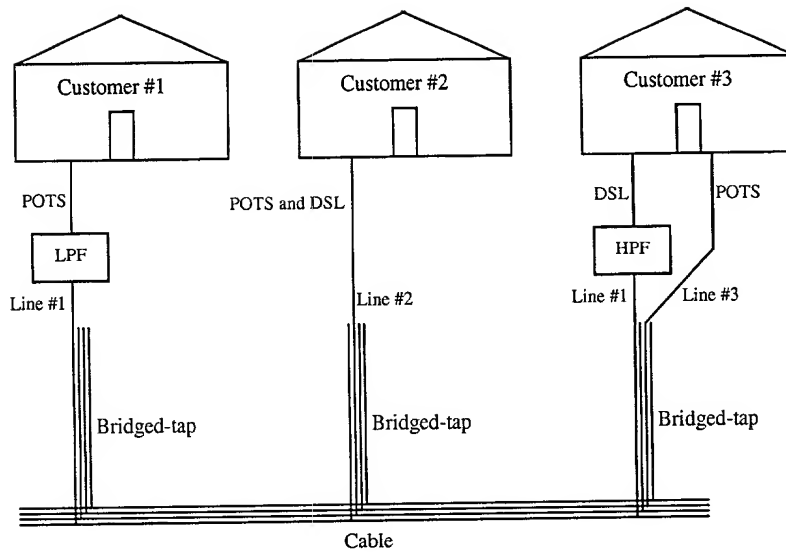
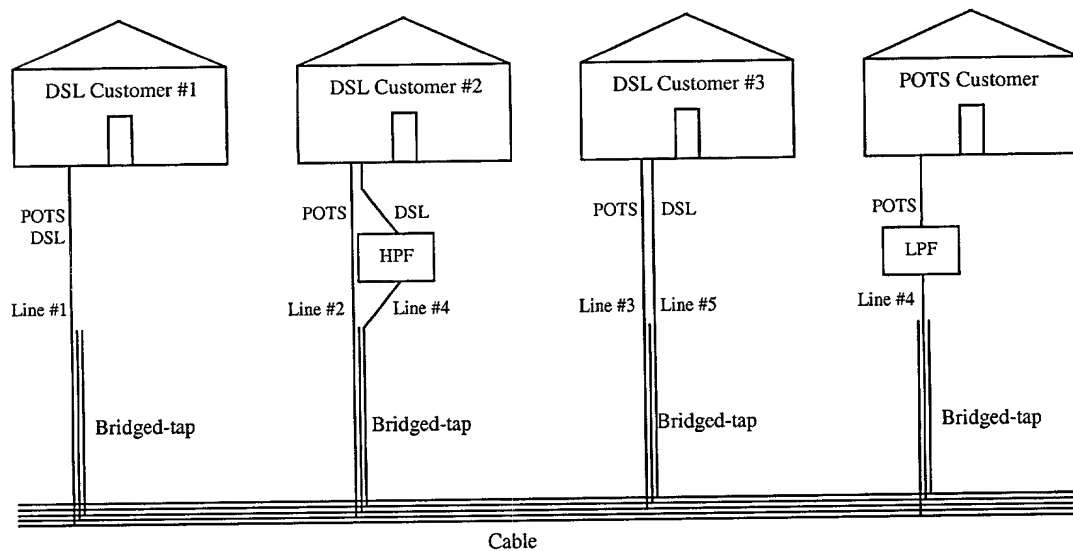


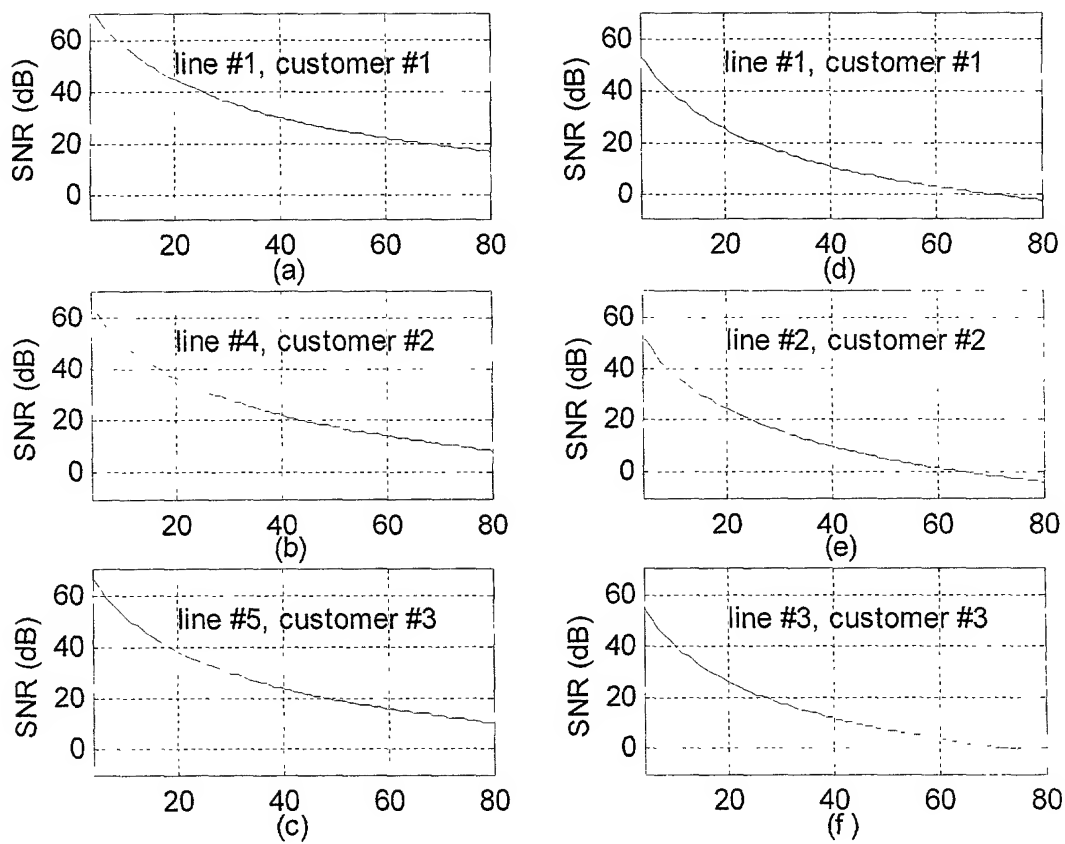
Figure 2: Assigning fat-pipe by sharing lines discussed in Example 1. Customer #1 has a fat-pipe service consisting of line #1, a high-pass filtered line #3, and a high-pass filtered line #4. Customer #2 has POTS service. Customer #3 and Customer #4 have POTS service through the low-pass filtered line #3 and low-pass filtered line #4 respectively. They both share their lines with customer #1.



**Figure 3: Assigning DSL services, using the phone lines of other POTS customers, in order to minimize crosscoupling between the DSL services, as discussed in Example 2. Customer #1 has POTS service through the low-pass filtered line #1. Customer #2 has DSL service through line #2. Customer #3 has DSL service through the high-pass filtered line #1 and shares the line with customer #1. Line #3 provides POTS for customer #3.**



**Figure 4: Optimal assignment of lines to 3 DSL customers in a neighborhood, as discussed in Example 3.**



**Figure 5: Downstream SNR with optimal line assignment given by (a), (b), (c), and without optimal line assignment given by (d), (e), (f), for Example 3. The vertical axis is SNR in  $dB$  and the horizontal axis is frequency in  $KHz$ .**